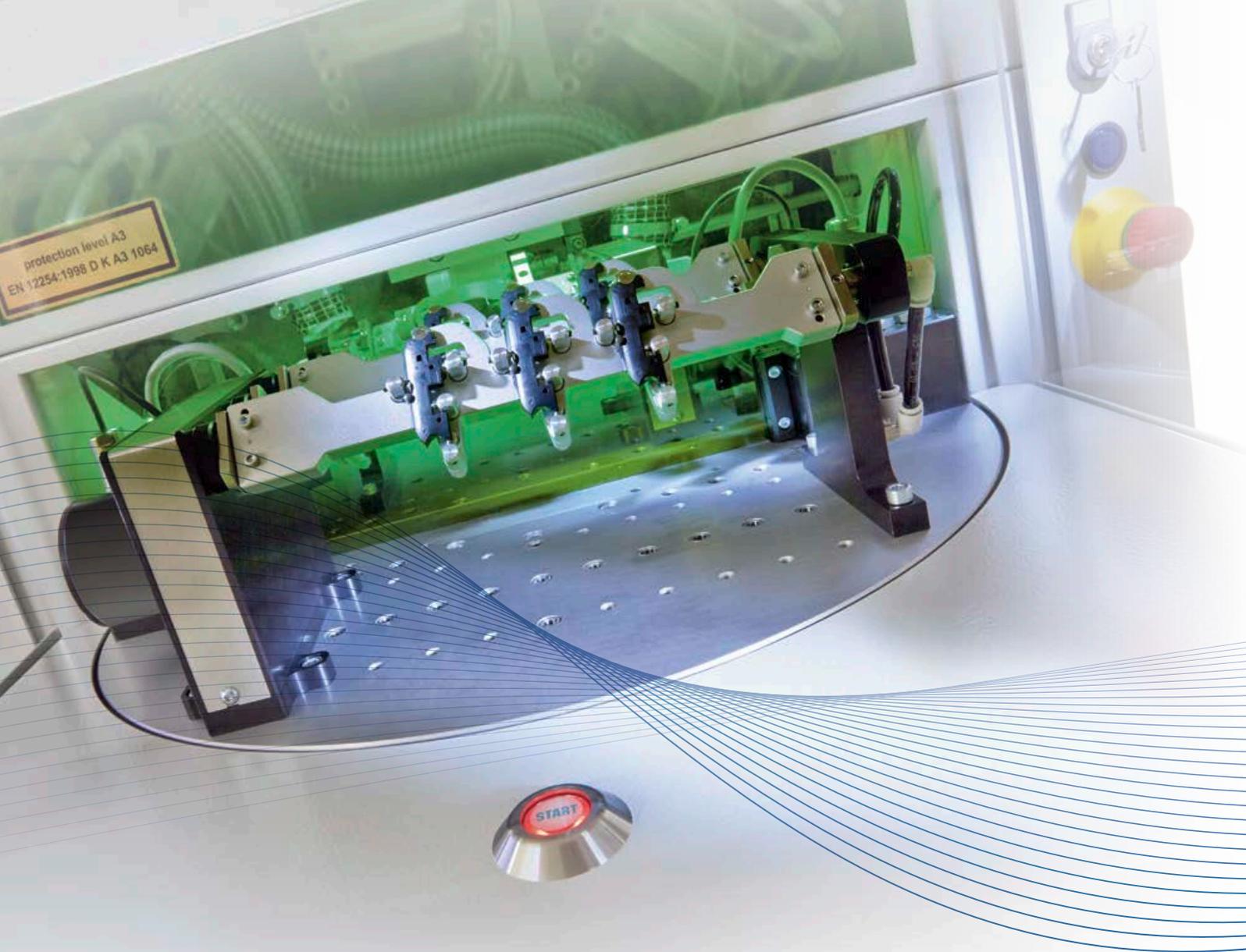


With Rotary Indexing Table and Vision System
LDS Production with the LPKF Fusion3D 1200





Performance Increased ...

With the latest model in the Fusion3D line, LPKF is extending its program of high-performance laser systems for LDS processing. Equipped with state-of-the-art components and a high-quality rotary indexing table, small, medium and large series of 3D Mechatronic Integrated Devices (MIDs) can be produced very economically.

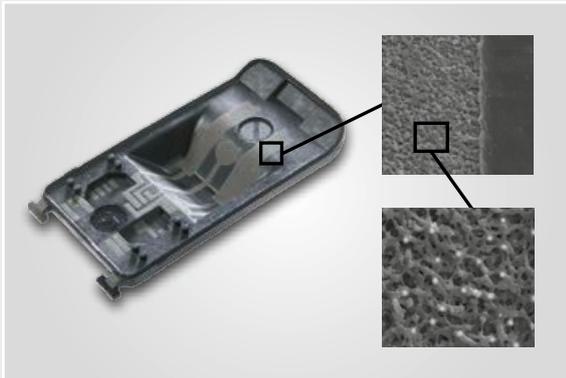
Gaining in Flexibility

The LPKF Fusion3D 1200 was especially developed for laser direct structuring of 3D MIDs. The laser structures only the area which will become the conductor tracks onto the components. Subsequently, the structures are metallized and thus become conductive. MID components take on electric and mechanical tasks simultaneously.

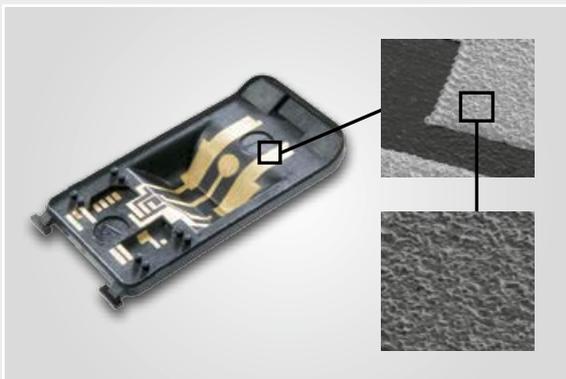
They can be found as antennas and sensors, for example, in devices with tight space and weight requirements.

In addition, the use of three-dimensional molded interconnect devices reduces the assembly outlay and allows completely new product layouts.

The LPKF LDS Process



Surface after laser structuring



Surface after metallization



Left: Assembled component. Right: Bond on electrolessly metallized Cu/Ni/Au bond pad.

1. Injection Molding

The laser-structurable shaped parts are produced in single-shot injection molding from commercially available plastic that is provided with additives.

In comparison to multi-shot injection molding, only one simple tool is required and the molding process is quicker.

2. Laser Activation

Activation of the thermoplastic material is done by the laser beam. A physical-chemical reaction creates metallic seeds – that is the activation process.

In addition to activation, the laser forms a micro-rough surface on which the copper is firmly anchored during the metallization.

3. Metallization

Metallization of the LPKF LDS components begins with a cleaning step. After that, an additive conductor track build-up takes place in currentless copper baths, typically in a range of 8 to 12 μm .

As a final step, there is generally a currentless application of nickel and a thin layer of gold. Even application-specific coatings such as Sn, Ag, Pd/Au, OSP, etc. can be applied in this process.

4. Assembly

Many laser-activatable plastics with a high level of heat resistance such as LCP, PA 6/6T or PBT/PET blend are reflow-solderable and thus compatible with standard SMT processes. When applying soldering paste, dispensing is the standard process to create different height levels.

There are now several providers of technical solutions for three-dimensional assembly.

LPKF Fusion3D 1200



- Short non-productive times
- Up to three processing units
- Simple set-up by optional vision system
- Suitable for small series to mass production

Growing with the Tasks

The LPKF Fusion3D 1200 laser system has been developed as a flexible solution for a range of different requirement sets for laser structuring. High-quality components and a maintenance-friendly design provide for maximum machine availability.

Various processing units (PUs), each consisting of a laser source, optical components, and a scanner, an optional vision system, and three rotating devices on the rotary indexing table enable the system to be adapted to the customer's layout and performance requirements. Up to three PUs can be installed to shorten cycle times.

Safety and Modular Structure

The table halves have four separate I/O ports each and can be supplied with a vacuum and compressed air. A light curtain provides an actively monitoring access guard.

Access for maintenance work is easy and requires no special tools. All electrical connections are situated on the back and a bigger monitor with USB port eases user operation.

Non-Productive Times Shortened

The integrated rotary indexing table reduces non-productive times: While one component is being processed, another one can be fed in or removed.

Each table half can handle a separate project. Thanks to the height control of the work area, it can be ensured that work is always done in focus, thus preventing manufacturing errors.



Simultaneous processing of different projects possible



Finger tips for a robot hand
(Source: Citec, Bielefeld University)

Support in Process Optimization

And it's not just the technology that is outstanding: drawing on their extensive experience with LDS technology, the LPKF process engineers provide support in process set-up and optimization.

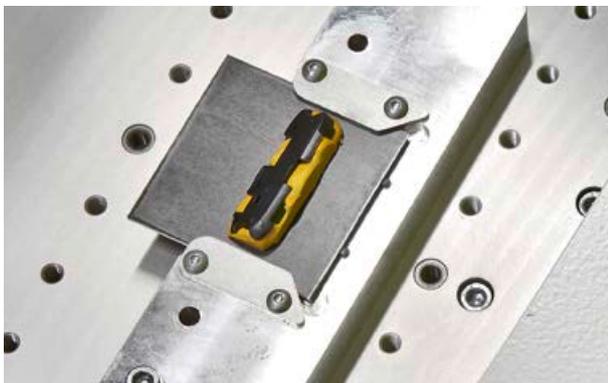
Powerful Software

Following LPKF's switch to a new, uniform machine system software in 2012, the LPKF Fusion3D product line also profits from CircuitPro 3D. Included in the delivery, it provides for intuitive, uniform operation, fast calculation routines and sophisticated functions for optimizing the structuring processes.

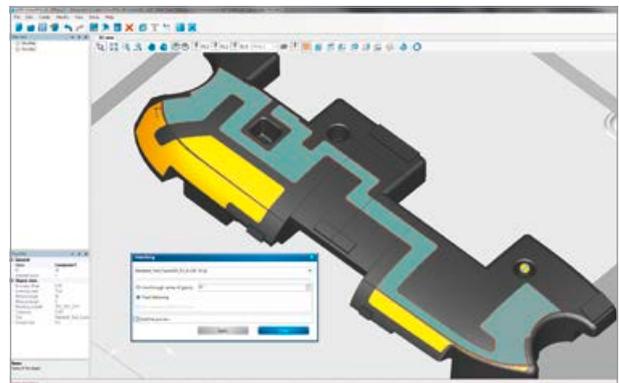
Rotary Indexing Table for Improved Performance

With a rotation time of less than one second per revolution, the highly dynamic rotary indexing table considerably increases throughput: While one half is being processed, the operator can take out components and insert new ones in the second half.

A light curtain ensures safety: the table only starts rotating when the loading area is free. The hole pattern on the working surface is identical to that of the Fusion3D 1100, allowing for interchanging of projects between the two systems.



Easy production of small series



With several processing units, each PU takes over its own area (here: yellow and blue)

LPKF LDS Prototyping – Easy Production of 3D Mechatronic Integrated Devices

From the Idea to the 3D MID

Since introduction of the LDS process, LPKF has worked at simplification of the technology. An important result has been the development of a reliable prototyping process.

The foundation is a component that is produced directly from the CAD program on a 3D printer. A smooth surface is the only important requirement here. LDS capability is added through painting with LPKF ProtoPaint LDS – done very easily with a spray can.

The LPKF Fusion3D 1200, for example, takes over the laser structuring. It has a rotary indexing table, a height-adjustable working surface and an optional vision system. Finally there is instant metallization with LPKF ProtoPlate. A compact metallization system is filled with ready-for-use bath liquids and then the structured components are immersed.

No chemical knowledge is required for this. After two hours in the bath, the metallization is finished.

The LDS Prototyping Process at a Glance



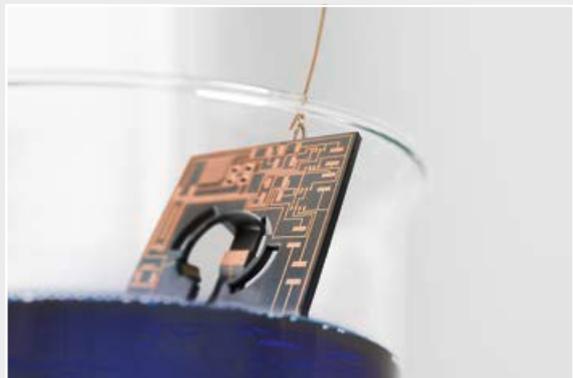
1. Creating the three-dimensional part



2. Painting the part with LPKF ProtoPaint LDS



3. Structuring the circuit tracks with the LPKF Fusion3D 1200



4. Metallization with LPKF ProtoPlate

Additional Applications for LPKF Fusion3D Systems

The LDS technology is also ideal for other materials and applications that profit from the non-contact laser process, such as the ablation of gold or silver layers from ceramics. The Fusion3D systems are also able to engrave metal surfaces, cut flexible PCB foils, and trim ceramic resistors.



Worldwide Support for Laser Direct Structuring

Wherever they are in the world, users of LPKF systems can be supported from our application centers in Germany, the USA, Japan, Korea and China. At these centers, users have access to LPKF's extensive experience in laser material processing and the laser direct structuring process.

Technical Data: LPKF Fusion3D 1200	
Laser class	1
Structuring area (X x Y x Z)	With 100 µm laser spot: 200 mm x 200 mm x 80 mm (7.8" x 7.8" x 3.1") With 50 µm laser spot: 100 mm x 100 mm x 40 mm (3.9" x 3.9" x 1.5")
Number of processing units (PU)	1 – 3
Accuracy*	± 25 µm (± 1 mil)
Structuring speed	Max. 4 000 mm/s (157" per second)
Input data formats	IGES, STEP
Software	LPKF CircuitPro 3D
Laser wavelength	1 064 nm
Laser pulse frequency	10 kHz – 200 kHz
Machine dimensions (W x H x D)	868 mm x 1 877 mm x 1 642 mm (34.2" x 73.9" x 64.6")
Machine weight	Approx. 675 kg (1 488 lbs)**
Operating conditions	
Electric supply	400 V, 3L+N+PE, 16 A, 50/60 Hz, ~2,2 kVA
Cooling	Air-cooled
Ambient temperature	22° C ± 2.5° C (71.6° F ± 4° F)
Humidity	Max. 60 %
Exhaust unit	Required; available as an option
Machinable materials (selection)	Nickel, copper, stainless steel, LDS plastics, powder coatings and LDS paint, gold and silver paste, ceramic, tin

* Calibrated scanfield

** Including 3 Processing Units (PU), excluding exhaust unit

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